Figure 1

Norsworthy Model Corrected
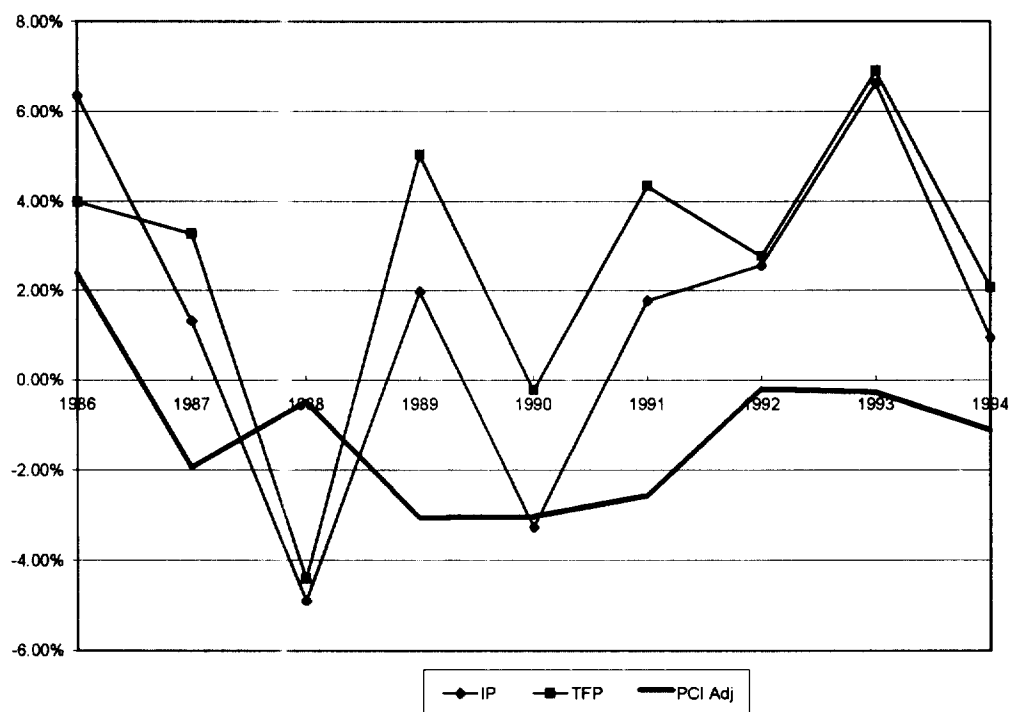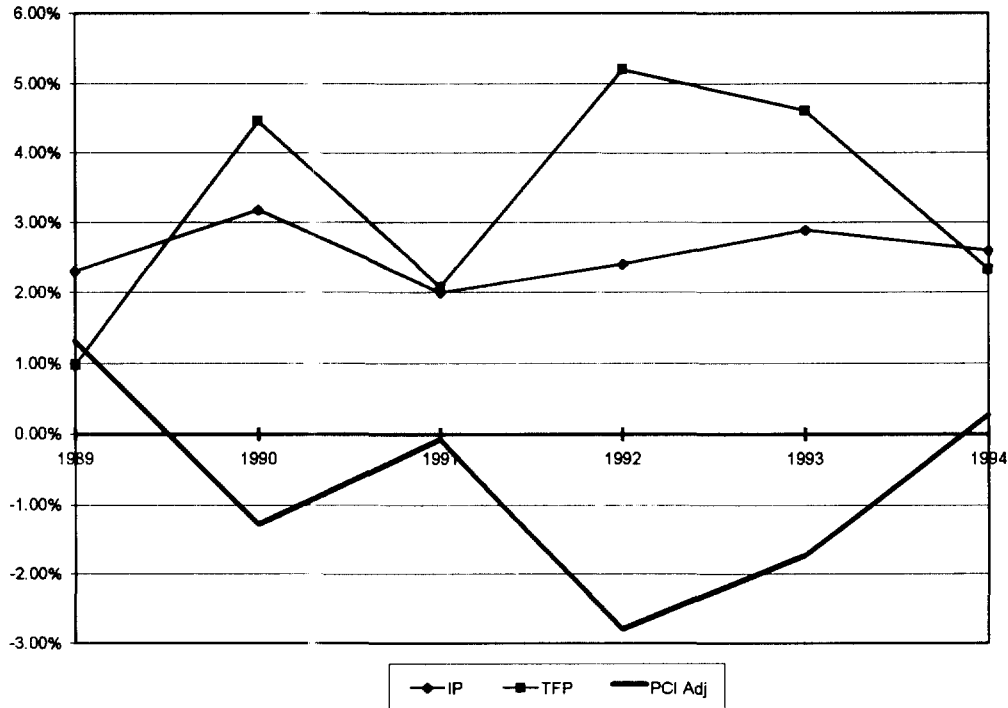### Input Prices, TFP and PCI Adjustment by Year

Figure 2

Christensen Model Corrected
Input Prices, TFP and PCI Adjustment by Year

B. **The Commission should adopt fixed PCI reductions, based on the direct**
   approach, for a four year period.

For the reasons set out above, pursuing the development of a rolling average

methodology does not provide any compelling advantages. Therefore, Sprint urges the

Commission to adopt, based on the record evidence, fixed PCI reductions for a four year plan,

and reevaluate the rolling average methodology at that time.

Rather than adopting a new X-Factor or factors in the context of the existing "GDP-

PI minus X" formula, the Commission should utilize the direct approach to develop a fixed

PCI reduction to replace that formula. The evidence in this docket amply demonstrates that

GDP-PI is not a valid measure of LEC input changes, and therefore retaining this component

of the current formula, without independently measuring LEC input price differentials, would

retain significant biases in the Commission's price cap plan rate adjustments.

C. **The Commission should adopt two PCI reduction options, a 1.1% factor with sharing and a 2.1% factor with no sharing.**

Sprint believes that the corrected version of the Christensen study, in particular,

provides a reliable basis for determining a PCI reduction, using the direct approach, for the

next four years. Based on the first four years of the initial price cap plan (1991-1994), the

direct approach using corrected Christensen data (see Table 2) would have yielded PCI

reductions of 1.1% per year. This point estimate is consistent across a range of other

reasonable results. For example, using a 5 year rather than 4 year average of corrected

Christensen data also yields a 1.1% reduction. The 4 and 5 year results for the corrected

Norsworthy study are somewhat higher at, respectively, 1.89% and 1.45%, but over the full

ten years of the Norsworthy study, the average PCI reduction would have been 1.06%.

The 1.1% reduction is also consistent with results produced under the current price

cap plan, based on GDP-PI and a 4.0% X-Factor. Over the 1991-1994 period, the average

inflation adjustment in the Commission's formula was 3.4%. Combining that with the 4.0%

productivity offset would have yielded cap reductions averaging .6% annually, as compared to

the 1.1% that would have been yielded by the direct approach. Alternatively stated, the 1.1%

reduction would have been equivalent to a 4.5% X-Factor in the existing formula over the

1991-1994 time frame.

The 1.1% reduction, based on total company (i.e., interstate and intrastate) results,

should be used as the lower bound "productivity" election, with sharing thresholds and ranges

equivalent to those used with the existing 4.0% productivity election. The 1.1% PCI reduction

does not reflect the full impact of Sprint's proposed plan. Sprint also urges the Commission to adopt the per line cap for the Common Line basket. Sprint has estimated that the industry-wide average impact of the per line cap is equivalent to a .5% increase in the productivity factor.[30] The total impact of the Sprint proposal, then, is equivalent to an annual PCI reduction of 1.6% for LECs choosing the sharing option.

The higher, no sharing, PCI election should, in addition to the base 1.1% reduction, incorporate both an interstate growth differential and a transitional CPD. Since the baseline PCI reduction of 1.1% reflects total company data, the interstate adjustment should reflect only the output growth differences between interstate and total company. It would be inappropriate to apply the interstate differential to the lower PCI option insofar as those companies electing that option primarily do so because they are not experiencing the interstate growth rates required to financially justify moving to the higher, no sharing option. Moreover, the adjustment should be based on recent history and should not include the output growth created by the substantial, one-time reductions in interstate access due to separations changes and the implementation of SLCs. The interstate growth differential should be set at .5%, based on the recent (1990-1994) growth difference between interstate services and total company growth.[31] The need for an interstate differential should be reevaluated after four years. In addition, Sprint supports a transitional CPD of .5%, which should be phased out over the four year life of the plan (i.e., the CPD should be reduced by .125% each year). In the short term, the CPD will provide additional benefits to consumers as LECs move away from rate of return regulation. Over the longer term, the CPD will act as a barrier to some

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[30] See Attachment F.
[31] See Table 3

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LECs choosing the higher, no sharing PCI reduction. Thus, phasing out the CPD over four years will both incent companies to move to the higher PCI reduction and eliminate the last vestiges of rate of return regulation.

The no sharing PCI reduction would be 2.1% in the first year of the plan, phasing down to 1.6% by the fourth year. In addition, the impact of the per line cap on the Common Line basket would be equivalent to a further .5% reduction, yielding reductions of 2.6% in the first year. Again, recasting this proposal in the terms of the 1995 annual price cap filing, the 2.6% rate reduction slightly exceeds the 2.4% reduction (inflation of 2.9% less an "X" of 5.3%) for no sharing LECs under the current plan.

VI. A VOLUNTARY NO-SHARING OPTION MUST BE CONTINUED.

In its Comments, Sprint supported the Commission's tentative finding that, in the long run, sharing should be eliminated because "[no-sharing] is the only mechanism that will truly incent LECs to achieve higher levels of productivity."[32] However, Sprint also acknowledged that: "... it is unlikely that all price cap LECs will be able to achieve results that meet or exceed industry average productivity, and thus implementing only a single high, no-sharing option is probably not achievable [in the short run.]"[33] The record in this docket supports Sprint's position that a no-sharing option must be continued.

AT&T supports Sprint's argument that, currently, multiple options with at least one no-sharing option must be maintained:

> A system of multiple X-Factors, coupled with sharing requirements for the lower X-Factors, would provide better overall incentives that a system without any sharing requirement at all. Sharing should be eliminated only

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[32] Sprint Comments at 9.
[33] Sprint Comments at 10.

for the highest X-Factor, so that any LEC that can achieve the higher level
of productivity will in fact choose that X-Factor.[34]

AT&T then suggests that the Commission establish two X-Factors, the lower one to have a

sharing obligation, but the higher X-Factor to be a no-sharing option.

Sprint agrees with AT&T that the Commission should adopt two PCI [X-Factor]

adjustment factors, one with sharing and one without. Although Sprint has previously

supported three productivity elections, the experience gained in the last price cap filing

suggests that the middle productivity choice is superfluous (no company elected that option).

Finally, several commenters recommend the immediate elimination of sharing and the

adoption of one X-Factor or PCI adjustment factor.[35] Sprint does not support this view and

while Sprint supports the elimination of sharing as a long term goal of price cap regulation, it

does not believe that conditions are ripe for such regulation at this time.

For instance, Ameritech suggests that sharing has no place in a competitive

environment.[36] There is no evidence on this record, nor could there be, that the LEC

environment is a competitive one. While the Telecommunications Act of 1996 provides a

framework for eventual competition in the local exchange and access markets, as the

Commission has recognized, competition does not exist today except in a nascent stage. [37]

Bell South argues inter alia that:

> Adoption of the USTA moving-average X-Factor based on a LEC industry-
> wide average of TFP will ensure that all of the improvements in productivity by

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[34] AT&T Comments at 38. See also, MCI comments at 21 "The high option X-Factor can include no sharing,
but should be set at a level that will return to ratepayers a share of the benefits
the LEC will realize as a result of having no sharing obligation."

[35] See e.g., Comments of BellSouth at 38-39, Comments of Ameritech at 9-10, and Comments of Bell Atlantic
at 2-7.

[36] Comments of Ameritech at 9

[37] In the Matter of Sprint Corporation Petition for Declaratory Ruling Concerning Section 310(b)(4) and (d)
and the Public Interest Requirements of the Communications Act of 1934, as amended, I-S-P-95-002,
Declaractory Ruling and Order. FCC 95-498, released January 11, 1996 at para. 79, footnote 118..

the LECs are available to consumers (depending on the pricing behavior of the IXCs), and thus will eliminate both the perceived need for and inefficiency of the sharing mechanism.[38]

BellSouth's argument is not sustainable. As herein demonstrated, a rolling or moving average adjustment is not practical or sustainable at this time. Moreover, as the RBOCs enter the long distance market, the need for oversight of RBOC provision of access services will be heightened, not diminished Simultaneous RBOC entry into the long distance market and deregulation of RBOC access services would create the incentive and opportunity for discrimination and cross-subsidy and would threaten existing long distance and potential local service competition.

VII. A PER-LINE COMMON LINE FORMULA SHOULD BE ADOPTED.

In its Comments, Sprint argued that the Commission should adopt a per-line formula instead of the existing "Balanced 50-50" approach to ensure that common line revenue growth tracks line growth, consistent with the non-traffic sensitive nature of common line costs.

Many of the Commenters argue that a separate formula is not necessary with a TFP methodology.[39] For example, Southwestern Bell argues:

> The different treatment of demand growth in the separate Common Line price cap index formula and the associated maximum CCL rate formula (as an alternative to the typical API calculations used in all other baskets) should be eliminated. Use of TFP results already incorporates the full productivity effects of growth in Carrier Common Line (CCL) minutes of use. The TFP approach incorporates the effects on productivity of all demand growth, including CCL, and all costs, including any and all costs that may be associated with CCL output growth. Because demand growth is fully reflected in TFP growth, the additional demand adjustment currently included in the price cap index formula for the Common Line Basket should be eliminated.[40]

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[38] Comments of BellSouth at 39.

[39] See e.g., Comments of Southwestern Bell Telephone Company at 35-38, Comments of NYNEX at 28-31, and Comments of Ameritech at 8-9.

[40] Comments of Southwest Bell Telephone Company at 35.

Southwestern's concerns are not unfounded, but its solution is flawed. It is inconsistent to cap common line revenue growth by lines when TFP is calculated on a per minute basis, especially given that minutes are growing faster than lines. Southwestern's solution would be to take line demand growth out of the formula so that common line revenue will grow with common line minutes consistent with the calculation of TFP.

Additionally, as noted in its Comments,[41] Sprint agrees that it is theoretically possible to design a TFP that captures and incorporates common line minutes of use on an on-going basis; however, Sprint does not believe that would be the best or even are advisable solution. The problem such a solution creates, as previously noted by Sprint, is that the growth effect would be spread to all baskets rather than being directly applied to carrier common line charges.[42]

Rather, Sprint believes that its suggested common line per-line capping mechanism, that caps common line revenue per line at the base year level, is the appropriate solution.[43] This cap would be adjusted annually for PCI changes by multiplying the cap by base period lines each year. The EUCL revenue would then be subtracted to derive CCL revenue and the CCL revenue would be divided by base year MOU to derive the new CCL per minute charge. Obviously, this formula will require an adjustment in any measure of historical productivity used to establish the X-Factor to avoid a double counting effect. [44]

Accordingly, Sprint urges the Commission to adopt the per-line formula for the Common Line adjustment as set forth in Sprint's Comments and above.

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[41] Sprint Comments at 13.
[42] Id.
[43] Id.
[44] Id. at 13, footnote 27.

VIII. THE EXOGENOUS COST RULES SHOULD NOT BE REVISED.

The Commission sought comment on whether additional revisions to the exogenous

costs rules should be made. In its Comments, Sprint argued that no additional changes should

be required and specifically argued against MCI's proposal to limit exogenous cost treatment

to Commission-ordered changes that result in shifting costs between the interstate and

intrastate jurisdictions.[45]

Most parties concurred with Sprint's positions.[46] For example, Ameritech argues that:

> the Commission should not preclude in advance the possibility that particular
> costs might appropriately be treated as exogenous under any PCI Adjustment
> Factor that it adopts in this proceeding. For that same reason, exogenous cost
> changes should not be limited to only those that result in jurisdictional cost
> shifts.[47]

Likewise, AT&T argues that the current rules should be maintained:

> because most accounting changes are treated as endogenous under the
> Commission's newly adopted standard [In the First Report and Order the
> Commission limited exogenous treatment for accounting changes to those that
> have an economic cost.], maintaining the current system should not be unduly
> burdensome to the Commission. Moreover, the Commission should maintain
> the flexibility that the current system permits. In the First Report and Order,
> the Commission established a set of procedures under which interested parties
> can make a showing regarding whether exogenous treatment for a given
> change is appropriate. [Citations omitted.] These procedures adequately
> protect all parties by giving them the an [sic] opportunity to show, on an
> individual case-by-case basis, that a given change should be allowed exogenous
> cost treatment. Those procedures should be continued.[48]

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[45] Sprint Comments at 14-15
[46] See e.g., US West Comments at 27; Ameritech Comments at 12.
[47] Ameritech Comments at 12
[48] AT&T Comments at 45-46

Accordingly, Sprint believes that the existing rules are adequate to protect all parties, whether it be from confiscatory taking, inappropriate exogenous treatment, or burdensome administrative procedures and should be kept in place.
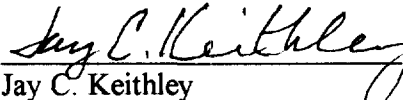
IX. CONCLUSION.

In conclusion, Sprint urges the Commission to utilize the direct approach, as set forth by Dr. Cronin, to develop a fixed PCI reduction to replace the existing GDP-PI minus X-Factor formula. The Commission should adopt a four year plan with two fixed PCI adjustment factors, one with sharing and one without and then should evaluate whether rolling average methodology may be adopted at the end of the four years. The proposed direct approach is simpler than the full differential approach and is reflective of the realities of LEC performance.

Additionally, Sprint urges the Commission to use a separate Common Line adjustment formula based on a per line basis and to maintain the exogenous cost recovery rules in their present form.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I, Melinda L. Mills, hereby certify that I have on this 1ˢᵗ day of March, 1996, sent via U.S. First Class Mail, postage prepaid, or Hand Delivery, a copy of the foregoing "Reply Comments of Sprint Corporation" in the Matter of Price Cap Performance Review for Local Exchange Carriers, CC Docket No. 94-1, filed this date with the Acting Secretary, Federal Communications Commission, to the persons on the attached service list.

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ATTACHMENT A

Examining the Appropriate Role of Prices in Price Cap Regulation

Examining the Appropriate Role of Prices in Price Cap Regulation

February, 1996

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Elisabeth Colleran
Michael Miller
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Table of Contents

Executive Summary

The *Fourth Further Notice of Proposed Rulemaking* raised several issues concerning the Local Exchange Carrier (LEC) Price Cap Plan. The objective of this analysis is to provide comment relative to specific issues raised by the Federal Communications Commission (FCC) in the *Fourth Further Notice.*[1] In these comments, we present evidence concerning the biases embedded in the modified differential price cap approach utilized in the current LEC price cap formula and in the proposed United States Telephone Association (USTA) Total Factor Productivity (TFP) method.[2] Specifically, we focus on the role of the price change measurements within a price cap regime and the implications the selection of alternative formula specifications and price indices can have on the overall accuracy of the price cap measure.

The research in this report directly addresses the sources of bias within a price cap methodology based on a modified differential approach. Specifically, a review of regulatory precedents, research, and data analysis and modeling are combined to determine that these biases include: 1) the use of an aggregate inflation measure as a proxy for the price changes in a given sector of the economy; 2) the selection of the GDP-PI as the measure of aggregate inflation; and 3) the exclusion of a measure of the input price differential between telecommunications and the general economy based on the assumption that the differential is zero. In our analysis, we explicitly address several substantive issues concerning the underlying composition and consistency of the data that has been employed in the development of the current LEC price cap formula and the proposed USTA simplified TFP model. In fact, compositional and definitional problems with data applied in previous analysis can be directly credited with the biases in the specification of the price cap formula.

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[1] Federal Communications Commission, *Fourth Further Notice of Proposed Rulemaking*, FCC 95-406, September, 27, 1995.

[2] The current LEC price cap formula and the USTA proposed formula are similar in approach in that they are both specified to capture the change in LEC output prices by utilizing a broad based general economic price measure (in both cases, the GDP-PI) adjusted for the relative productivity growth in the telecommunications sector. For purposes of this study we term this approach "the modified differential approach". The USTA proposal differs from the current LEC price cap formula in that it applies a TFP approach to measure the relative productivity growth in the telecommunications sector. Currently, the USTA has specified a LEC TFP growth rate of 3.1 versus the aggregate growth in TFP of .3 (1990-1994). The LEC price cap formula currently reflects an offset whose origin lies in the same TFP studies employed to determine AT&T's offset plus two non-TFP studies. Following reviews of these studies, the productivity offset in the LEC price cap formula was set at 2.8, with an additional .5 Consumer Productivity Dividend. Later, after further reviews, the offset was raised to 4.0. However, the central focus of our review is to examine the specification of the price cap formula and supporting price indices, rather than focus on the calculation of the productivity component of the X-factor. As a result, the comments presented in this paper can be applied to the general framework employed in both the current LEC price cap formula and in the USTA price cap proposal.

In general, our quantitative analysis reveals that the biases that exist in the current LEC price cap formula and in the proposed USTA price cap form are significant and measurable. Our analysis compares the *modified differential approach* with two alternative, more appropriately specified price cap formulas -- the *full differential approach* and the *direct approach*. Our comparison of price cap formulas is developed applying consistent and clear definitions of publicly available data sets. In comparing the full differential approach with the modified differential approach over the 1985-1993 period, we find an aggregate price index which consistently overstates economy-wide product price inflation by over .8 percent per year and aggregate input prices which exceed telecommunications input prices by about .9 percent per year. Thus, the modified differential approach formula would overstate required LEC output price changes by 1.79 percent per year. Comparing the modified differential approach with the direct approach, we find that the aggregate price index (the GDP-PI) overstates telecommunications input price changes by about 1.5 percent per year and that the X-Factor is smaller since it nets out aggregate productivity. In other words, a smaller TFP offset is deducted from a larger price increase resulting in an error of 1.79 percent per year in permitted LEC output prices, assuming an aggregate TFP of .29, as estimated by the BLS, over the 1985 to 1993 period.

Exhibit ES-1 presents LEC output price changes calculated for the direct approach, the differential approach, the USTA's most recent modified differential method, and the current LEC price cap formula[3] over the 1985 to 1993 period. As can be seen, both the direct approach and full differential approach calculate a compound annual reduction of more than 1.7 percent while USTA's proposed approach would have resulted in a price increase of .82 percent per year[4] -- a difference of 2.5 percent per year. Over this same period, application of the LEC price cap formula would have reduced rates by .39 percent per year. Thus, the USTA formula would have raised prices by .82 percent per year, the current LEC price cap formula would have lowered prices by .39 percent per year and the two correctly specified alternatives would have lowered prices by about 1.7 percent per year.

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[3] In order to standardize our analysis over the 1985-1993 period (i.e., to consistently use revised data), we have employed the annual average change in GDP-PI, rather than the fourth quarter to fourth quarter change employed in the LEC price cap formula.

[4] If we standardize TFP offsets, we obtain a bias of 1.79 between the direct and full differential approaches relative to USTA's method.

Exhibit ES-1
Comparing LEC Price Changes Generated by Alternative Price Cap Formulas
(Compound average annual growth rates)

Year	Direct Equation (1)	Full Differential Equation (4)	Modified Differential Equation (3)	
			USTA	Current LEC Formula
	I	II	III	IV
1985	NA	NA	NA	NA
1986	-2.44	-3.13	0.05	-1.16
1987	-2.54	-1.96	0.36	-0.85
1988	-2.08	-1.93	1.13	-0.08
1989	-1.69	-1.37	1.71	0.50
1990	-1.34	-1.15	1.74	0.53
1991	-1.30	-1.26	1.24	0.03
1992	-1.35	-1.57	0.38	-0.83
1993	-1.20	-1.33	-0.02	-1.23
1985-93	-1.74	-1.72	0.82	-0.39
1988-93	-1.38	-1.34	1.01	-0.20

Note: Column (I) uses a Telecommunications TFP of 3.85; Column (II) uses a Telecommunications TFP of 3.85 and an Economy-wide TFP of 0.31 Column (III) uses a LEC TFP of 3.1 and an Economy-wide TFP of 0.31; Column (IV) uses an offset of 4.0.[5] See pages 12-14 below for specification of equations.

Therefore, in comparing the modified differential price cap formula to the two more appropriately specified alternatives price cap approachs we find measurable biases that overstate permitted LEC prices under either the current LEC price cap formula or the USTA proposed simplified TFP methodology. The operational validity of a LEC price cap regime, as a result, could be greatly improved by the adoption of a correctly specified approach to price cap calculations. Since the direct approach requires less information, this would be the preferred approach.

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[5] The TFP measure of 3.85 for the telecommunications is consistent with the specification of equation (1) in **Section 3.2** and the calculations discussed in **Section 4.3.6.2.** This measure was developed for the 1985 to 1991 time frame using a national composite output price calculated through 1991 in a previous study by the authors. See: F.J. Cronin, et al., *Pennsylvania Telecommunications Infrastructure Study.* Prepared for the Pennsylvania Public Utility Commission, DRI/McGraw-Hill, Lexington, MA, March 1993. In this same study, the authors calculated a longer term measure of productivity gains in the telecommunications sector over the 1963-1991 time frame of 3.0. The 3.85, although not directly corresponding to the timeframe presented in **Exhibit ES-1** is more appropriate in the current comparison than the 3.0. However, the focus of this current study is not to calculate TFP for the telecommunications sector. The 3.1 measure of LEC TFP applied in Column III was developed by Christensen Associates for USTA.

1.0 Evolution and Current Status of LEC Price Cap Plan

1.1 Introduction

In 1990, the Federal Communications Commission (the FCC) replaced rate-of-return regulation for the Bell Operating Companies and GTE Operating Companies with price cap regulation, effective January 1, 1991.[6] This action followed the FCC's 1989 decision to eliminate traditional rate-of-return regulation for AT&T and replace it with a price cap regime.[7] The price cap formula adopted by the FCC for the Local Exchange Carriers (LECs) includes a general measure of inflation (i.e., the Gross National Product Price Inflator -- GNP-PI) and an X-factor, representing the productivity difference between the telecommunications sector and the total economy.[8] The purpose of the X-Factor is to account for the fact that the telecommunications sector has traditionally experienced greater productivity gains and lower input price changes than the economy as a whole.[9]

In the *LEC Price Cap Order,* the FCC scheduled a performance review. The first phase of this review was completed in March 1995.[10] This performance review represents an endorsement of the concept of incentive regulation and of a price cap methodology, while recognizing that changes to the price cap framework implemented between 1988 and 1990 may be required. For example, while the original LEC plan provided for earnings above 11.25 percent, the FCC expected such outcomes to be the exceptions -- not the norm. In fact, by 1992 LEC rate of return

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[6] Policy and Rules Concerning Rates for Dominant Carriers, CC Docket No. 87-313, 5 FCC Rcd 6786 (1990) *(LEC Price Cap Order).*

[7] Policy and Rules Concerning Rates for Dominant Carriers, CC Docket No. 87-313, Notice of Proposed Rulemaking, 2 FCC Rcd 5208 (1987), Further Notice of Proposed Rulemaking, 3 FCC Rcd 3195 (1988) *(Further Notice),* Report and Order and Second Further Notice, 4 FCC Rcd 2873 (1989) *(AT&T Price Cap Order).*

[8] In 1991 the U.S. Department of Commerce substituted the 45-day estimate of the Gross Domestic Product Price Inflator (GDP-PI) for the 45-day estimate of the Gross National Product-Price Inflator. The difference in definition is essentially that the GDP-PI excludes overseas production by U.S. firms and includes U.S. production of foreign-owned operations. The original LEC price cap formula employed the GNP-PI. In 1995, the FCC adopted the revision to substitute the GDP-PI in the formula. See: Federal Communications Commission, *Price Cap Performance Review for Local Exchange Carriers,* CC Docket No. 94-1, FCC 95-132 (released April 7, 1995) *(First Report and Order),* p. 155.

[9] *Fourth Further Notice,* p. 4.

[10] *First Report and Order,* p. 7.

averaged 12.25 percent.[11] Yet while returns were increasing, growth rates of LEC productivity were purportedly slowing.[12]

As a result, in the *First Report and Order*, the FCC rightly revised several aspects of the LEC price cap plan on an interim basis. Concurrently, the FCC stated that it expected to make additional long-term changes to the price cap plan after further proceedings. Specifically, the FCC explicitly recognized, among other issues, the importance of the role of the X-Factor in the price cap index (PCI) calculation by concluding that a more formal and timely measure be developed to track local exchange carrier performance.[13] Importantly, the FCC stated their preference for an X-Factor productivity calculation that reflects a total factor productivity (TFP) approach.[14, 15]

In its *Fourth Further Notice of Proposed Rulemaking*, the FCC sought "comment on a number of issues regarding methods for establishing the price caps."[16] Specifically, the FCC has recognized that certain biases may exist in the current price cap framework. While the current focus of the regulatory proceedings may be on improving the accuracy of the X-Factor through improved productivity measures, other embedded biases must be identified that could continue to overstate permitted LEC price increases. Therefore, a more general review of the approach underlying the current LEC price cap formula and the proposed United States Telephone Association's (USTA) TFP method[17] is warranted to improve the operational validity of LEC price cap's -- specifically relative to the fundamental specification of the price cap formula and

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[11] *First Report and Order*, p. 19.

[12] Specifically, the proposed measure of productivity offered by the USTA was lower than the baseline X-Factor. See: L. R. Christensen, P. E. Schoech, and Mark E. Meitzen, Christensen Associates, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation." May 1994; L. R. Christensen, P. E. Schoech, and Mark E. Meitzen, Christensen Associates, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation 1993 Update." January 16, 1995. It should be noted that an increasing rate-of-return is not necessarily inconsistent with a slowing rate of productivity growth. For example, note that rate-of-return is a nominal concept; TFP is a real concept. Thus, the apparent anomalous increase in the rate-of-return and concurrent decrease in TFP could be explained simply by increasing revenue from higher prices.

[13] *First Report and Order*, p. 66.

[14] Total Factor Productivity is a measure of the real change in factor inputs required by a firm or industry to produce a unit of output. See C. A. Bush and M. Uretsky, *First Report and Order, Appendix F*.

[15] *First Report and Order*, p. 67.

[16] Other issues raised in the proceedings for further inquiry include, sharing the common line formula, and exogenous costs. See: *Fourth Further Notice*, pp. 3-4.

[17] The current LEC price cap formula and the USTA proposed formula are similar in approach in that they are both specified to capture the change in LEC output prices by utilizing a broad based general economic price measure (in both cases, the GDP-PI) adjusted for the relative productivity growth in the telecommunications sector. The USTA proposal differs from the current LEC price cap formula in that it applies a TFP approach to measure the relative productivity growth in the telecommunications sector.

the selection of the various components of the formula. However, while the sources of the biases are numerous and conceptually complex, solutions to the problems are straightforward.

1.2 The LEC Price Cap Formula

Price caps have evolved at the federal level as a method to introduce and foster competitive behavior in sectors transitioning away from previously regulated monopoly conditions. The FCC has stated "that price caps represent a regulatory approach that is superior to rate-of-return because price caps are better suited to encourage efficiency and innovation in the provision of services."[18] Price caps attempt to control prices, rather than profits, by allowing prices to fluctuate below predetermined upper limits, without triggering a regulatory review. This flexibility allows the regulated firm to respond adequately to market signals such as price competition by alternative service providers. Specifically, a price cap framework seeks to foster an environment where the benefits of competition can prevail while protecting consumers and competitors from any potential monopoly rent seeking behavior of the incumbent firm.

The level of the price cap, therefore, becomes of critical importance -- too low and the incumbent firm is financially disadvantaged, too high and the incumbent firm will retain monopoly rents. As such, price cap regimes create several challenges for regulators. These challenges include, among other issues, the specification of an appropriate price cap formula and the measurement of relevant price and productivity indices. For the LECs, the Price Cap Plan ultimately implemented in 1991, evolved through an involved process of analytical review and significant input from interested parties.

1.2.1 The Evolution of the Modified Differential Approach

In the decade preceding the FCC price cap inquiry the Interstate Commerce Commission (ICC) successfully implemented price caps as a form of alternative regulation. The ICC instituted a price cap regime for the nation's rail system in the early 1980's. The general price cap framework adopted and refined by the ICC between 1980 and 1989, directly measures changes in railroad input prices versus railroad TFP in order to develop a maximum cap for regulated rail output

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[18] Federal Communications Commission, *In the Matter of Policy and Rules Concerning Rates for Dominant Carriers*, CC Docket No. 87-313, April 17, 1989, p. 9.